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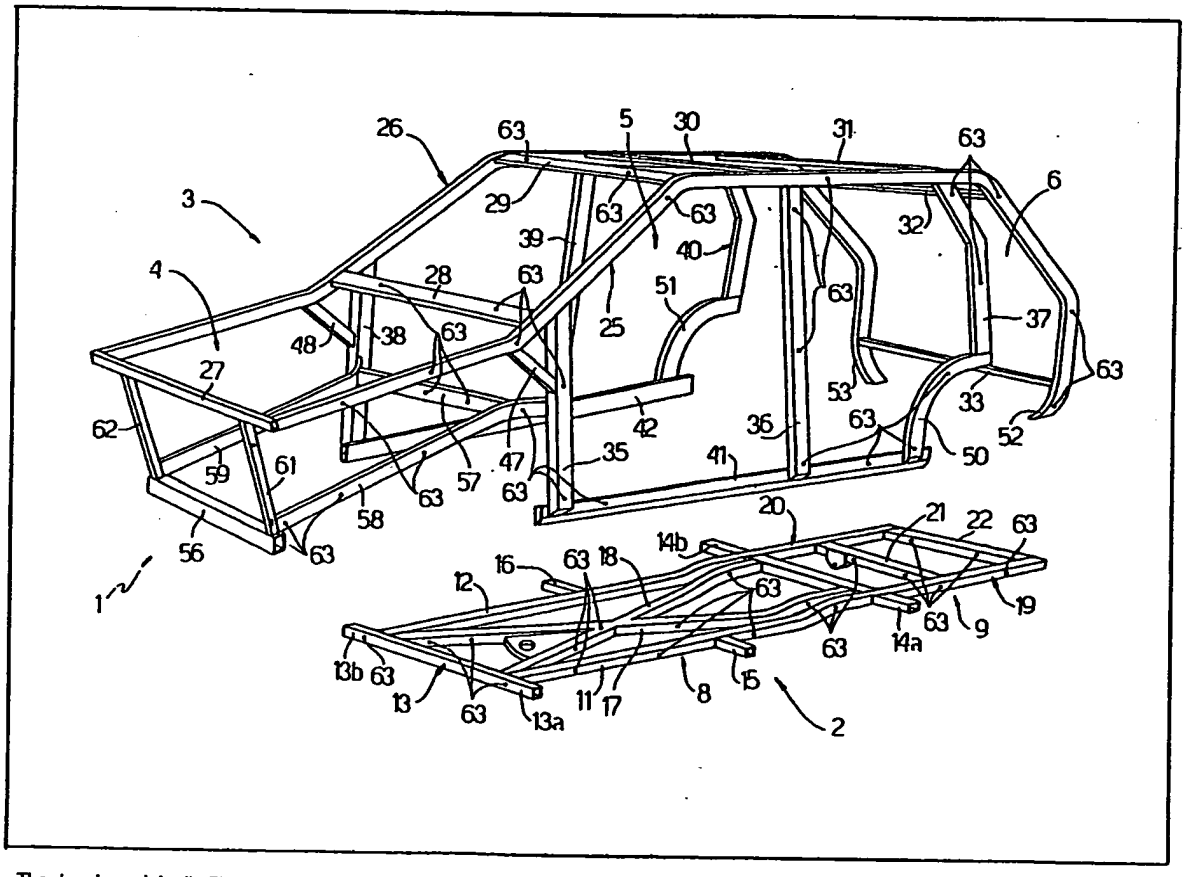
(54) Vehicle frame structure

(57) Motor vehicle load-bearing structure consisting of a number of parts connected together in grid formation. The outstanding feature of the said structure is that each of the said parts consists of a closed tube section with appropriate longitudinal shaping.



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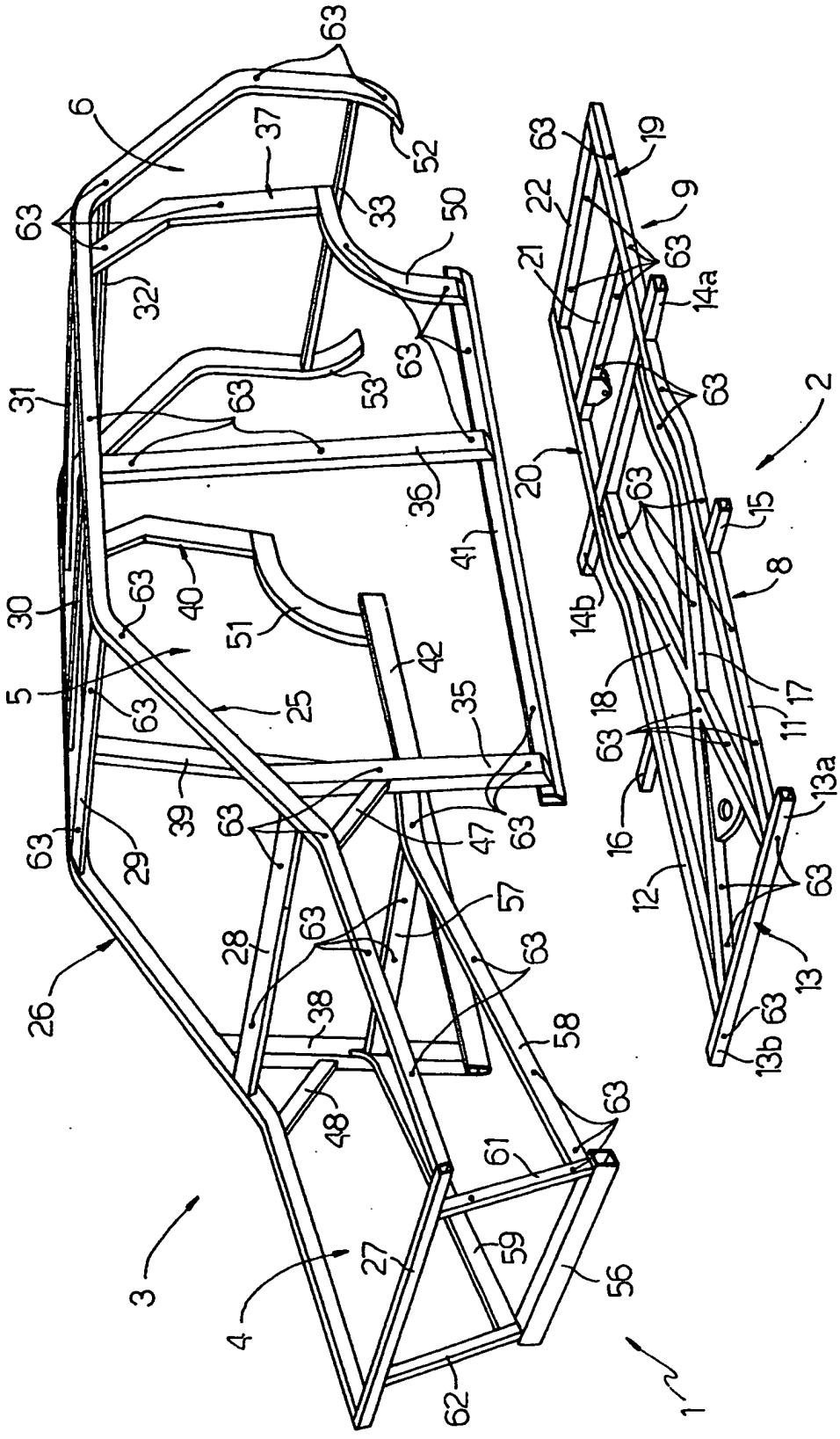
The drawing originally filed was informal and the print here reproduced is taken from a later filed formal copy.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SPECIFICATION

Motor vehicle load-bearing structure

The present invention relates to a motor vehicle load-bearing structure consisting of a number of parts connected together in grid formation.

Reticular load-bearing structures consisting of pressed and welded sheet boxes are already known. Each part on the said known structures consists essentially of two pressed or drawn sheet metal halves, each with straight edges overlapped and welded to the corresponding edges of the opposite half so as to form a single hollow piece. The various parts are then connected together by special joints (T, cross, etc . . .) so as to form a reticular load-bearing structure of the required shape.

On account of the specific shape of the various component parts, the said known structures present a number of drawbacks, particularly in connection with the type of manufacturing process required which demands a considerable number of presses and, above all, dies for making the half shells. Furthermore, provision must be made for a heavily-manned metalworking station for assembling the large number of parts involved. Problems also arise when protective painting the reticular structure on account of the recesses formed along the said welded edges which are difficult to coat. The same applies to the joints which prevent the paint from reaching the inside of the structure.

The aim of the present invention is to provide a motor vehicle load-bearing structure which, as compared with known load-bearing structures, is light-weight, though, at the same time, ensuring a high degree of rigidity, strength, shock-absorbing capacity, etc. and which can be manufactured more easily and cheaply. A further aim of the present invention is to provide a load-bearing structure that is resistant to atmospheric agents, in particular, corrosion and on which the parts required for completing the body and mechanical assemblies on the engine can be fitted easily and safely.

With these aims in view, the present invention relates to a motor vehicle load-bearing structure consisting of a number of parts connected together in grid formation, characterised by the fact that each of the said parts consists of a closed tube with appropriate longitudinal shaping. The invention will now be described by way of a non-limiting example with reference to the attached drawing which shows a partially exploded top view in perspective of a load-bearing structure according to the present invention. Number 1, in the said drawing, indicates a complete motor vehicle load-bearing structure, according to the present invention, consisting of a base frame (2) fitted on top with a reticular cage (3) which, in the sample shown, has a front compartment (4) for the engine, a middle compartment (5) for the passenger compartment and a rear compartment (6) which may, for example, be used as a luggage compartment.

If we examine base frame 2 closely, we can see that it consists essentially of a pair of rectangular reticular structures (8, 9) the rear one of which is slightly higher than the one in front.

Structure 8 consists of two parallel side members (11, 12) each of which, at the end connected to structure 9, has two bent sections for blending structure 8 into structure 9 which is slightly higher. The opposite ends of structure 8 are marked off by two tubular cross members (13, 14) each of which is connected to the end sections of side members 11 and 12 so as to form two extensions (13*a*, 13*b* and 14*a*, 14*b*) projecting outward on either side of the said side members 11 and 12. Roughly in the middle of the latter are a further two extensions projecting outward on either side and marked 15 and 16. Finally, in the area formed by side members 11 and 12 and cross members 13 and 14, rectangular structure 8 has a further two tubular sections (17, 18) arranged in the form of a cross along the diagonals of rectangular structure 8 and connected to the said tubular cross members 13 and 14.

Rectangular tubular structure 9, on the other hand, has two straight tubular side members (19, 20) arranged parallel and connected together by two tubular cross members (21, 22) of which the one marked 22 is outermost.

With reference to the top cage structure (3), according to the present invention, this consists essentially of a pair of shaped tubular sections (25, 26) each of which extends from the engine compartment (4) to the luggage compartment (6) so as to form the passenger compartment (5) over the top. Sections 25 and 26 are connected by a number of tubular cross members (27, 28, 29, 30, 31, 32 and 33). To each shaped tubular section (25, 26) is connected one end of three pillars (35, 36, 37 and 38, 39, 40 respectively) each of which is connected at the opposite end to tubular side members 41 and 42 respectively. Each of the said members 41, 42 serves to strengthen structure 1 and connect cage 3 to extensions 13*a*, 14*a*, 15 and 13*b*, 14*b*, 16 on frame 2. If we examine the pillars mentioned above more closely, we can see that pillar 35 consists of a tubular section connected at the bottom to the end of tubular section 41 and, at the top to section 25 forming the side of the windscreen opening. An intermediate point on pillar 35 is also connected, via tubular cross piece 47, with a further point on tubular section 25, at the bend in the engine compartment next to cross member 28. The same applies to pillar 38 in which case the cross piece is marked 48.

Pillars 36 and 39 are essentially straight, whereas pillars 37 and 40 present a number of bends, in particular, a bent bottom section (50, 51) in the shape of an arc at the rear of the structure for housing the rear fenders.

From the rear cross member (33) on the luggage compartment (6) two curved tubular extensions (52, 53) project downwards for connection to the opposite ends of cross member

22 on frame 2.

Engine compartment 4 is essentially formed by a parallelepiped reticular structure the top sides of which consist of one end of tubular sections 25 and 26 and cross members 27 and 28. The bottom edges of the said parallelepipes structure consist of a bottom front cross member (56) and a rear cross member (57) connected together by tubular side members 58 and 59 respectively. Cross member 57 is connected at the ends to pillars 35 and 38 underneath the point at which the abovementioned cross pieces 47 and 48 are connected. Front cross member 56, on the other hand, is connected to cross member 27 by means of two tubular sections (61, 62) fitted short of the ends of cross member 27 which are connected, as already stated, to the ends of sections 25 and 26. Number 63 indicates through holes on each of the abovementioned tubular sections the function of which is to allow protective paint to get inside each of the said sections. The manufacturing process for preparing and assembling the component parts of load-bearing structure 1 is extremely simple.

The starting material is a closed tubular section which can be bought very cheaply on the market. On standard type forming machines with suitable tooling, the various parts are then bent longitudinally into the required shape. These are then transferred over to a metalworking station where, on a small number of machines (welders, cutters, bolting machines, etc.) load-bearing structure 1 is assembled. The parts may either be welded or simply screwed together using a known type of lock bolt.

Provision could then be made for painting using, for example, an electrophoresis plant, in which case paint would be evenly distributed over the outer surface as well as inside the parts thanks to through holes 63.

At this stage, the load-bearing structure is ready to be fitted with mechanical parts, consisting of the engine and transmission, as well as with the remaining body parts which are assembled using whichever system is thought best in each individual case.

From the description given, the advantages the load-bearing structure according to the present invention offers as compared with the known types mentioned earlier will be more than clear.

Firstly, making the structure from tubular section in place of welded halves provides for far greater mechanical strength and rigidity, besides being much lighter, so as to withstand whatever stress may be exerted on it, in particular, bending and torsional stress which is what concerns designers most from the practical point of view. The secret of this rigidity and strength lies essentially in the closed section of each component piece. As the structure can safely withstand any stress exerted on the vehicle when running, the body parts fitted to it need only be designed to enclose and protect the space inside. By selecting the size and cross section of each part carefully, a structure can be made with different rigidity areas. For example, the centre section housing the passenger compartment could be made more rigid than the front and rear sections so that even high impact energy can be dispersed by deforming only the front and rear sections.

As already mentioned in passing, the shape of the section used for making the various parts enables the remaining body parts to be fitted easily on to structure 1. The component parts, in fact, have flat surfaces which provide a firm, ample supporting face for connecting means between the structure and the parts being connected to it.

Resistance to atmospheric agents, particularly corrosion, is far superior to that of known structures owing, in particular, to the elimination of welding recesses on structures consisting of two half shells welded along the edges.

Finally, from what has already been said, it will be clear that the load-bearing structure according to the present invention can be manufactured easily and cheaply in that the component parts are simply cut and bent, both operations requiring only low-cost machinery, unlike that required for known types of structures.

To those skilled in the art it will be clear that changes can be made to the tubular sections forming the abovementioned structure without, however, departing from the scope of the present invention. For example, no limit need be posed to the type of tubular section used the cross section of which may be round or polygonal with longitudinal reinforcement ribs inside and/or outside.

Though the material preferably selected for each of the abovementioned parts is metal, any suitable material may be used providing each of the said parts, according to the present invention, is a closed tubular section.

CLAIMS

1. Motor vehicle load-bearing structure consisting of a number of parts connected together in grid formation, characterised by the fact that each of the said parts consists of a closed tube with appropriate longitudinal shaping.

2. Structure according to Claim 1, characterised by the fact that it consists of a first group of parts forming the base frame of the said structure and a second group of parts forming a reticular cage like an upside-down cup connected to the said frame.

3. Structure according to Claim 2, characterised by the fact that the said base frame consists essentially of a pair of rectangular structures with one side in common and essentially arranged on two parallel levels, one slightly higher than the other.

4. Structure according to Claim 3, characterised by the fact that each of the said rectangular structures has side members connected by cross members.

5. Structure according to Claim 3 or 4, characterised by the fact that one of the said rectangular structures has a pair of sections inside,

arranged in the form of a cross and connected at the corners of the said structure.

6. Structure according to any of the previous Claims from 2 to 5, characterised by the fact that the said reticular cage consists of a pair of tubular sections shaped to define the top edge of the said motor vehicle and connected by respective cross members, the said tubular sections extending lengthwise from the front to the rear of the said load-bearing structure.

7. Structure according to Claim 6, characterised by the fact that each of the said pairs of tubular sections is connected to pillars the opposite ends of which are connected to a tubular section connected to the said base frame.

8. Structure according to any of the previous Claims, characterised by the fact that each of the said closed tubular sections communicates with the outside either directly or via through holes.

9. Structure according to any of the previous Claims, characterised by the fact that each of the said tubular sections is weld connected.

10. Structure according to any one of the previous Claims from 1 to 8, characterised by the fact that adjacent sections are connected using lock bolts.

11. Structure according to any of the previous Claims, characterised by the fact that each of the said tubular sections has a polygonal cross section.

12. Structure according to any one of the previous Claims from 1 to 10, characterised by the fact that each of the said tubular sections has a round cross section.

13. Structure according to any of the previous Claims, characterised by the fact that each of the said closed sections has longitudinal ribs inside and/or outside.

14. Motor vehicle load-bearing structure essentially as described with reference to the attached drawing.

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